

## **The role of physiotherapy in Enhanced Recovery after Surgery in the intensive care unit**

Wainwright, Thomas W.; McDonald, David A.; Burgess, Louise C.

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**Title:** The Role of Physiotherapy in Enhanced Recovery after Surgery in the Intensive Care Unit

**Key points:**

- Enhanced Recovery after Surgery (ERAS) is an evidence-based, multi-modal approach to optimising patient outcomes following surgery. The role of physiotherapy within ERAS and intensive care units (ICU) is important.
- Patients admitted to an ICU following elective major surgery may suffer from physical, psychological and cognitive problems, which can impact their return to function and quality of life.
- ICU physiotherapists can enable patients to achieve ERAS programme aims throughout their stay in an ICU and this may accelerate the achievement of discharge criteria and subsequent return to function.
- Establishing a standardised rehabilitation programme, informed by key ERAS principles and delivered by specialist physiotherapists supported by a well-informed ICU team can have long term benefits to patients post-discharge.

**Authors:**

Thomas W. Wainwright PgDip PgCert BSc (Hons) MCSP (Associate Professor in Orthopaedics)<sup>a</sup>,

David A. McDonald ProfD BSc (Hons) MCSP (Visiting Fellow)<sup>a</sup>

Louise C. Burgess BSc (Hons) (Orthopaedic Research Assistant)<sup>a</sup>

<sup>a</sup> Orthopaedic Research Institute, Bournemouth University, 6th Floor, Executive Business Centre, 89 Holdenhurst Road, Bournemouth, BH8 8EB, UK;

twainwright@bournemouth.ac.uk; david.mcdonald@nhs.net; lburgess@bournemouth.ac.uk;

## **Introduction**

Enhanced recovery after surgery (ERAS) is a combination of perioperative care components built upon a multimodal approach that integrates evidence based interventions to reduce convalescences across multiple surgical procedures. Since ERAS was first implemented within hospitals over twenty years ago, post-surgical outcomes have improved for patients (Kehlet and Wilmore 2008). Length of stay has decreased, with no subsequent increase in readmission rates (Paton et al. 2014), with concurrent improvements in clinical outcomes whilst having a beneficial impact to healthcare resources. ERAS programmes are supported by evidence-based preoperative, intraoperative and postoperative procedures to accelerate the achievement of discharge criteria. ERAS originated in elective colorectal surgery but has spread to other surgical sub-specialties, including, but not limited to: gastrointestinal, hepatobiliary, orthopaedic, cardiac and gynaecologic surgery.

## **Physiotherapy and ERAS**

The role of physiotherapy within ERAS pathways is important in both preoperative and postoperative routines. Implementing a preoperative strength programme has been shown to promote musculoskeletal improvements in preparation for a forthcoming physiological stressor (Carli et al. 2010), and is an emerging key component of ERAS. A review of literature found preoperative exercise in patients scheduled for cardiovascular, thoracic, abdominal and major joint replacement surgery to be well tolerated and effective (Hoogeboom et al. 2014). Postoperative exercise programmes are also recommended by ERAS guidelines, promoting muscle hypertrophy and the return to function after major surgery (ERAS Society 2017).

Early postoperative mobilisation is a fundamental principle of good physiotherapy practice and of ERAS programmes. It has been shown to reduce the rate of morbidity and length of stay following major surgery (Epstein 2014; Kehlet and Wilmore 2008), with immobilisation due to hospitalisation causing a decline in muscle strength, insulin adherence and functional ability. Early mobilisation can accelerate the achievement of discharge criteria, and has been evidenced to reduce the rate of postoperative pulmonary complications, venous thromboembolism and infection (Epstein 2014). Early mobilisation can only be achieved through adequate pain control, and thus multi-modal opioid

sparing regimes which are central to ERAS programmes are essential. This is a fundamental principle within ERAS, in that each intervention whether that surgery and/or analgesic regimens must consider their impact on rehabilitation goals and how to best support early postoperative mobilisation. There are many surgery-specific barriers to early mobilisation, highlighting the importance of a multidisciplinary care team approach.

### **Intensive Care Unit (ICU) stay**

A patient may be admitted to an intensive care unit (ICU) after elective major surgery if they require postoperative support either due the complexity of surgery, or because of co-existing medical conditions. ICU admission is not always routine amongst all major surgeries that adopt ERAS principles, with orthopaedic procedures generally being the most well-tolerated by patients, and consequently rarely requiring ICU admission (AbdelSalam et al. 2012). ERAS guidelines highlight that gynaecologic, cardiac, pancreaticoduodenectomy, colorectal, hepatic and head and neck cancer patients may require a transfer to an ICU, depending upon their condition following surgery. Admission to an ICU is patient and surgery specific, with many programmes utilising preoperative risk models in an attempt to predict need for and length of stay within intensive care. Standardising postoperative ICU management can lead to reductions in length of stay with no increase to postoperative complications (Agarwal et al. 2012). Programmes within ICUs should consist of a multidisciplinary team who utilise a model of perioperative care components of enhancing recovery.

### **Physiotherapy within Intensive Care Units**

The aim of physiotherapy treatment provided within ICUs can be broadly separated into two: improving respiratory function, and initiating the rehabilitation process. Patients in an ICU may require mechanical ventilation to help their breathing; however this can lead to pulmonary complications. Respiratory physiotherapy involves early mobilisation where possible, repositioning patients within bed to optimise respiratory function, and utilising manual techniques or the manipulation of ventilator settings to clear lung secretions that build up within the lungs, when mobility and consequently deep breathing is limited. This helps to reduce the risk of pulmonary issues. Rehabilitation physiotherapy

focuses initially on maintaining range of joint motion to prevent contractures, and on reducing the muscle loss that occurs due to immobility whilst a patient is in an ICU. Rehabilitation then focuses as soon as possible to sitting, standing and then walking, in order to facilitate their return to physical function. Patients can become weak quickly, and the use of exercises, electrical stimulation and ambulation practice can reduce muscle atrophy and joint stiffness that may occur.

The aforementioned roles of a physiotherapist within an ICU assimilate strongly with the key ERAS principles for accelerating the achievement of discharge criteria. Thus, to ensure a patient admitted to ICU continues to achieve functional recovery, the role of the physiotherapist is important. The impact of a perioperative ERAS programme has been shown to reduce the incidence of pulmonary complications with sustained improvement evident one year after implementation in patients admitted to an ICU following elective major surgery (Moore et al. 2017). Utilising an evidence-based physiotherapy protocol that addresses pulmonary dysfunction and promotes early mobility has been found to be safe and effective in comparison to non-specialist care for patients on ICU (Hanekom et al. 2013). An appropriate level of clinical expertise should be required to safely work in a critical care environment and creating an algorithm to guide non-specialist therapists can encourage best practice physiotherapy (Sommers et al. 2015) promoted within ERAS guidelines.

Early mobilisation of critically ill patients in an ICU is a safe and effective intervention that may lead to significant improvements to functional outcomes (Adler and Malone 2012). An admission to ICU should therefore not mean that a patient is removed from an ERAS pathway. In fact, it may be argued that it is the ICU admitted patients that need ERAS the most. Mobilising a patient can include activities such as sitting, standing, ambulation and passive exercises performed by the physiotherapist. Functional exercise capacity, self-perceived functional status and muscle force has been reported to be greater at hospital discharge for patients receiving a passive or active exercise training session for 20 minutes a day. Early mobilisation has also been linked to a decrease in mechanical ventilation duration when a multidisciplinary team with a recognised leader can implement change to the ICU culture and practice (Hashem et al. 2016).

Barber and colleagues (2015) found barriers to early mobilisation within ICUs to be a lack of resources and communication; highlighting the importance of educating and including the ICU team within the traditional ERAS team of anaesthetists, surgeons, and ward based nurses and allied health professionals. Education should include the clinical aspects as well as combined working to ensure logistical factors are co-ordinated, such as the use of standard documentation. For example, ERAS patients are often managed on a specific ERAS pathway document, this needs to work seamlessly with ICU pathway documentation.

### **Rehabilitation post-discharge**

Following a critical illness or prolonged stay in an ICU, patients may suffer from physical, psychological and cognitive problems, which can negatively impact their health-related quality of life (Jones 2012). Intensive care unit-acquired weakness (ICUAW) is a clinical syndrome that occurs due to muscle atrophy and loss of muscle mass whilst a patient is intubated and mechanically ventilated. Recovery time increases with length of stay, and an effective rehabilitation programme is vital to ensure a patient can return as close as possible to their preoperative physical and mental health.

Functional limitations and persistent weakness may exist long after discharge, and therefore there is a need to increase the awareness and involvement of physiotherapists within the outpatient setting (Pawlik and Kress 2013). Physiotherapists are an essential component of the rehabilitation pathway, and can ensure that ERAS principles, proven to facilitate recovery, are adopted by patients once discharged from an ICU. The rehabilitation needs of a patient should be individualised and assessments are important to determine which physiotherapy and counselling resources are required. Consequently, there is a need for an adequate number of well-informed physiotherapists who are competent at managing critical care patients in an outpatient setting.

There is limited evidence regarding the effectiveness of physiotherapy interventions following admission to an ICU and ERAS guidelines for post-discharge rehabilitation are still evolving. Recent

literature has suggested that high intensity rehabilitation could lead to greater improvements in functional outcomes in comparison to lower intensity programmes (Bandholm and Kehlet 2012). The use of progressive resistance training (PRT) has been highlighted for augmenting a patient's hypertrophy, improving their strength, balance and muscular endurance (Borst 2004). Jones et al. (2013) found a self-help rehabilitation manual to be effective in aiding physical recovery and reducing depression, however many patients still recalled delusional memories from ICU, prompting the need for further psychological care. A physiotherapy-led, outpatient rehabilitation programme, involving education sessions and circuit based training has been proven to enhance exercise capacity along with significant psychological benefits following discharge from an ICU (McWilliams et al. 2009).

With this considered, a Cochrane review of exercise rehabilitation for recovery following discharge from an ICU was unable to determine an overall result for the effect of exercise training on recovery. Six studies were examined, three of the papers reported results in favour of post-discharge exercise training programmes and the remaining studies found no effect. Interventions included walking, strengthening exercises, education, arm and leg cycling exercises and self-help rehabilitation manuals (Connolly et al. 2015). Despite inconclusive results, the authors highlight the importance of physical rehabilitation for the recovery of a critical illness.

## **Conclusion**

The role of physiotherapy within ERAS and rehabilitation following intensive care is important and will be increasingly more so, as the development of ERAS programmes leads to a shift in outcome measures, from the current surrogate of length of stay, to functional and activity based markers of recovery. There is limited research available that focuses on the effect of an ERAS programme on outcomes for patients discharged from an ICU following elective major surgery. This cohort may have the most to gain from a multimodal approach that integrates evidence-based interventions. Critical care physiotherapists adopt roles that assimilate strongly with key ERAS principles, and they can play a vital role in ensuring patients remain on track with their ERAS pathway whilst in an ICU. Providing a more intense, co-ordinated rehabilitation programme for patients following discharge from an ICU,

delivered by a specialised physiotherapist and supported by a multidisciplinary team is hypothesised to improve recovery (Walsh et al. 2012).

### **Future Research and Investigation**

Future research should focus on establishing a standardised rehabilitation programme, informed by ERAS principles, which can be delivered by specialist physiotherapists within an ICU and in an outpatient setting. Prospective studies are needed to determine the long-term effect of early mobilisation and exercise based interventions. The ability to recover following discharge from an ICU can be more accurately measured when compared to values of baseline function, allowing clinicians to consider patients with pre-existing co-morbidities, who are less likely to respond to rehabilitation interventions. Thus, a safe and effective method for determining preoperative functional ability should be researched. Consideration of how to attain and importantly measure functional recovery should be the focus for physiotherapy research in the future, providing evidence for its inclusion in the ERAS programmes of tomorrow.

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